

## Facilities and Equipment

Tuesday, February 16, 2010  
1:52 PM

Warm  
Cold  
~~Warm~~  
Warm cooler

Today: Admin - Groups OK?  
HW for next Friday 2/26  
Email from group  
stating plan for first  
team assignment  
Clouds today  
Facilities + Equipment list  
Flume demo

Inserted from: <<file:///D:/FlowVis/Equipment/FlowFacilities.doc>>

Some stuff  
in my lab  
not ITLL yet

**Flow Visualization Equipment and Facilities**  
02/16/10  
MCEN 4228/5228 -002  
**Flow Visualization: The Physics and Art of Fluid Flow**

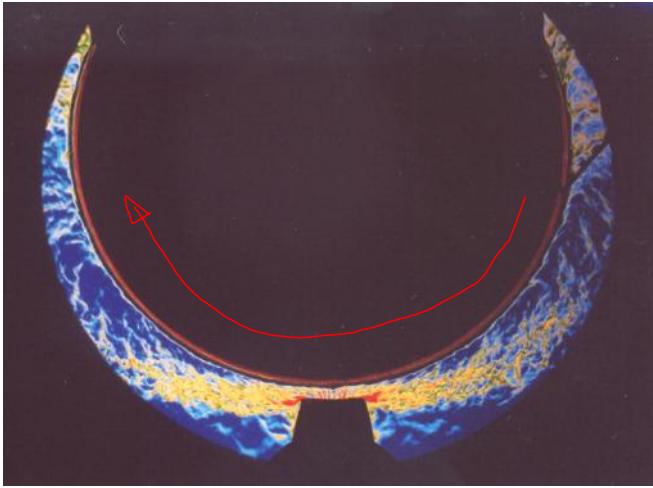
Here is a list of flow facilities; equipment for checkout is listed below.  
Make a reservation with Nick Stites ([Nick.Stites@Colorado.edu](mailto:Nick.Stites@Colorado.edu)) to use the big facilities in the ITLL (flume, wind tunnel, sink space room). To check out the smaller equipment in the ITLL, including stuff stored in the Media Shack, see Mike Elliott ([Mike.Elliott@Colorado.edu](mailto:Mike.Elliott@Colorado.edu)). His office is the checkout office on the 2B level of the ITLL. If he is not there, pick up the checkout phone on the south facing wall near the south stairs of either lab level; an equipment checkout person should be able to help you.

**AIR**

Facility	Lighting	Visualization	Phenomena	Access
Vortex ring generators; zeroblaster, or timed generator. Use in the ITLL sink space (can be made dark), or checkout for home use.	Try projector for light sheet, or strobe	<b>Stage fog</b>	Vortex rings, symmetric and asymmetric	Check out fog generators and timed vortex generator from ITLL; in MediaShack Check out zero blasters and projector from JH
Misc air flows	Strobe for volume vis	Dry ice vapor <sup>1</sup> humidifiers, steaming pots, medical nebulizers ( $< \$5$ ) <sup>2</sup> Fog generators	Jet flows, positive buoyancy convective flow	JH has nebulizers, humidifier
Color Schlieren, Large system for ECSL 121 only. 2 small systems for home checkout.	EG&G strobe, provided. X Maybe works. Car headlight for other light source; see Settles' book	Schlieren: Light bent by $\eta$ gradients  Could do stereo with 2 small systems	Convective flows from warm/hot objects: hands, candles, hair dryers (turbulent jet). You may need time to make	See Prof. Hertzberg, last two projects only.

Example

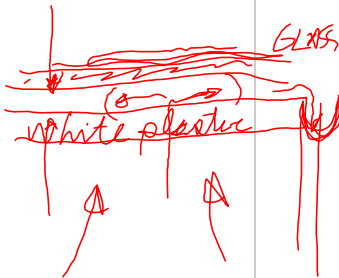
<sup>1</sup> Dry ice is solid carbon dioxide. Do not seal into a container, let it breathe. Handle with extreme care; it can freeze flesh. Cover with hot water for best effect, otherwise a water ice shell will form.  
<sup>2</sup> Medical nebulizers require a small compressed air source. Do not nebulize oils (i.e. canola) without use of a proper respirator or aerosol filter mask; oil coated lungs define pneumonia and asphyxiation.



			your own color stops. Can be used in water too.	
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### LIQUIDS

ITLL Flume	Strobe or 500 Watt work lights or North Star lights	Free surface or food coloring. Be sure to bleach water clean. Try poster paint dots for surface flows.	Free surface: weirs, hydraulic jump, inclined flow. Wakes: submerged objects, one can inject dye. Jets: coflow, reverse, transverse. Boundary layers and surface flows.	Sign up for flume time in ITLL. See Nick.Stites@Colorado.edu ITLL module engineer.  North Star lights in Durning Lab Greg.Potts@
Large Fish Tank in ITLL (50 gal)	Strobe	Food coloring. Be sure to bleach water clean afterwards	Short jets, vortex rings, boundary layers	Check with JH first. ITLL signup/checkout
Hele-Shaw cell	Work light or bounced strobe	Food coloring of detergent, corn syrup, water, etc	Saffman-Taylor instability	ITLL checkout
Reversible Flow Demo <a href="http://www.youtube.com/watch?v=p08_KITKP50">http://www.youtube.com/watch?v=p08_KITKP50</a>	Any lights will work; everything is slow	Food coloring	Glycerin or corn syrup. Students write in the fluid with dye and rotate the inner of two cylinders slowly. Upon reversing the direction, the original writing reappears.	ITLL checkout (take home 2 days). Two sets are available.
Blackstock Rheoscopic Fluid cell	Needs polarized light setup	Streaming birefringence	Cylinder wake	Prof. Hertzberg







Small (10 gal) Fish Tanks	Strobe	Food coloring, alumina powder, cornstarch particles; anything you are willing to put down your own drain.	Short jets, vortex rings, boundary layers Steady vertical vortex (from stirring machine)	ITLL checkout (take home 2 days)
Soap Film Tunnel; high humidity needed.	Diffuse sunlight is best.	Thin film effect	Jets, wakes, shear layers	ITLL signup/checkout. *2/25/10 Under Repair* normally in MediaShack
Fish Tank ECSL 121 (voltage source limitation)	Strobe or work lights	<u>Hydrogen Bubble apparatus</u>	Any motion in salted water	JH. Extra training and work required

#### Equipment Checkout

Please note that this equipment is often either expensive, rare, or both. Students checking out equipment are expected to take responsibility for the equipment. If equipment is lost, stolen, or broken, there are no funds available for replacement or repair (no, CU has no insurance for this stuff, it would cost too much).

Equipment	Location	Notes
Stage fog generator (large)	JH	Fog is nontoxic water-based glycol solution. \$40/gal., don't waste. Can leave residue.
Stage fog generator, (small)	ITLL MediaShack	
Zero Blaster ring generator and fog fluid	JH	
4.5" schlieren system	JH	
<b>CAMERAS</b>		
Olympus I-Speed high speed video system	ME Durning Lab. See John Coyle	Training required. Up to 30,000 fps, but is low resolution, and low sensitivity; needs lots of light.
Nikon macro 102 mm	See Prof. Hertzberg	
Stereo cameras (film)	See Prof. Hertzberg	

	LIGHTING	
Sunpak Auto 383 Flash (strobe) unit & 25' cable	See Prof. Hertzberg	
CW 5 Watt argon ion laser	See Prof Hertzberg	Serious training and a bit of repair required.
Misc black lights	ITLL checkout, MediaShack	
Party strobe	Mediashack	
500 W work lights, several sets	ITLL	
	MISC	
Gretag-Macbeth/X-Rite Eye-1 Spectrophotometer	See Prof. Hertzberg	For color calibration of monitors, cameras, printers and projectors.

Friday Color Mgmt